ALEXANDER ROAD HIGH SCHOOL

FEBRUARY 2021 TIME: 55 MIN

PHYSICAL SCIENCES CONTROL TEST 1

EXAMINER: CO **GRADE 12** TOTAL = 50

Instructions

- The question paper consists of 5 questions.
- Answer all the questions.
- Answer section A on the answer sheet provided AND section B on folio paper.
- A non-programmable calculator may be used.
- Number the answers correctly according to the numbering system.
- Round off to two (2) decimal places where necessary.
- A formula sheet is provided on the back of the A5 answer sheet.

SECTION A: Multiple choice

Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (1.1–1.10) in the A5 ANSWER SHEET, for example 1.11 D.

1.1 The acceleration due to gravity on Earth is greater than that on the moon.

Which ONE of the following statements is CORRECT?

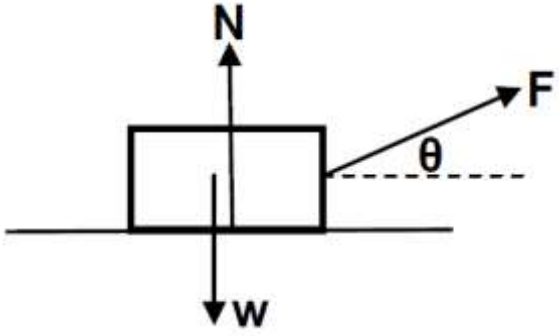
A The weight of an object on Earth is the same as that on the moon.

B The mass of an object on Earth is the same as that on the moon.

C The mass of an object on Earth is greater than that on the moon.

D The weight of an object on Earth is less than that on the moon.

1.2 The force diagram below shows the forces acting on a box.



Which ONE of the following equations for the magnitude of the normal force (N) is CORRECT?

A $N = w + F\cos\theta$

B $N = w + F\sin\theta$

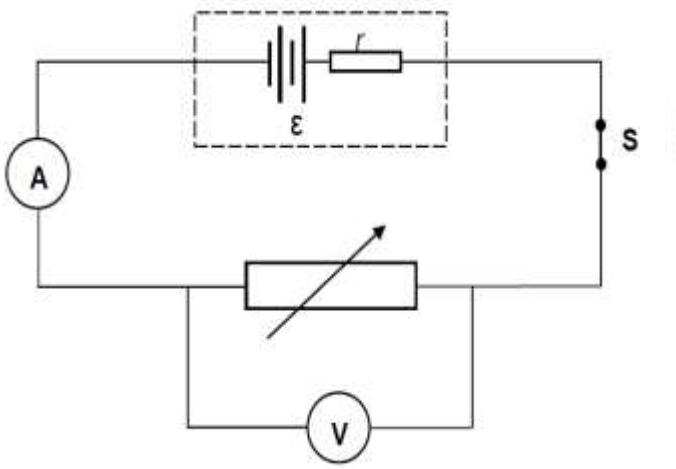
C $N = w - F\cos\theta$

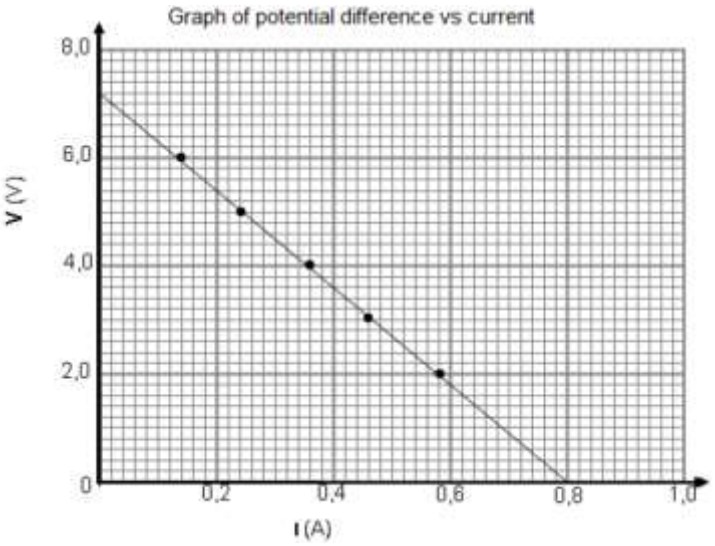
D $N = w - F\sin\theta$

1.3 When a resistor of resistance R is connected to a battery of emf Ɛ and negligible internal resistance, the power dissipated in the resistor is P.
If the resistor is replaced with a resistor of resistance 2R, without changing the battery, the power dissipated will be …

A ¼P
B ½P
C 2P
D 4P

1.4 Consider the circuit and the graph for **V** vs **I** for a circuit with a battery with **known** internal resistance.





The correct information obtainable from this graph is:

A x-intercept = emf
Gradient = internal resistance

B y-intercept = emf
Gradient = – (internal resistance)

C x-intercept = emf current
Gradient = emf

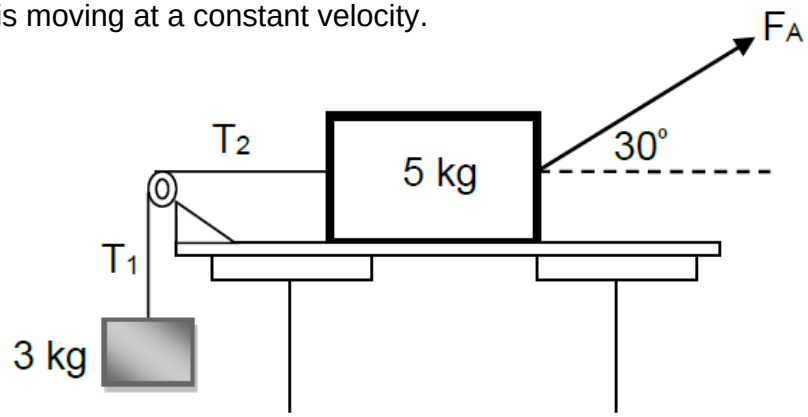
D y-intercept = internal resistance
Gradient = – (emf)

[8]

SECTION B

QUESTION 2

An object with a mass of 3 kg is allowed to hang over a frictionless pulley with a light inextensible string that is attached to the 5 kg box. The box is pulled on a rough surface with the force, **F_A**, of 36 N, and is moving at a constant velocity.



2.1 Determine the magnitude of the tension force on the 3 kg object (4)

2.2 Draw a free-body diagram of ALL forces exerted on the 5 kg box. (5)

2.3 Calculate the friction force between the surface and the 5 kg box. (5)

[14]

QUESTION 3

Halley's comet, with approximate mass of 1×10^{15} kg, was $1{,}3 \times 10^{8}$ km from the Earth (mass = 6×10^{24} kg) at its point of closest approach during its last sighting in 1986.

3.1 State *Newton's Law of universal gravitational* in words. (2)

3.2 Is the magnitude of gravitational force experienced by the comet **GREATER THAN, EQUAL TO, OR LESS THAN** the gravitational force experienced by the earth? (1)

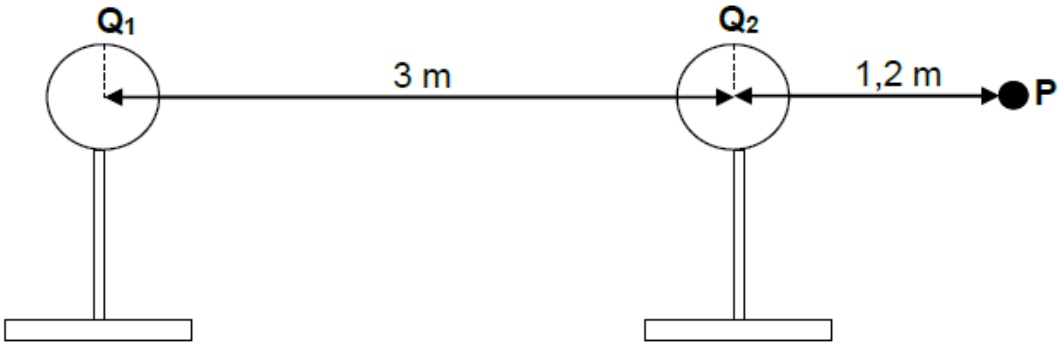
3.3 Name the Physics Law in words that is applicable to the answer given in QUESTION 3.2 above. (1)

3.4 Calculate the magnitude of the gravitational force exerted by the earth on Halley's comet at a point of closest approach. (5)

[9]

QUESTION 4

Two metal spheres charges, Q_1 and Q_2, on insulated stands, carry charges of $+6 \times 10^{-6}$ C and -4×10^{-6} C respectively are separated by a distance of 3m from their centres. A point charge at **P** is 1,2 m from Q_2 in the same plane as indicated in the diagram below.



4.1 Draw the electric field pattern between the two charges. (3)

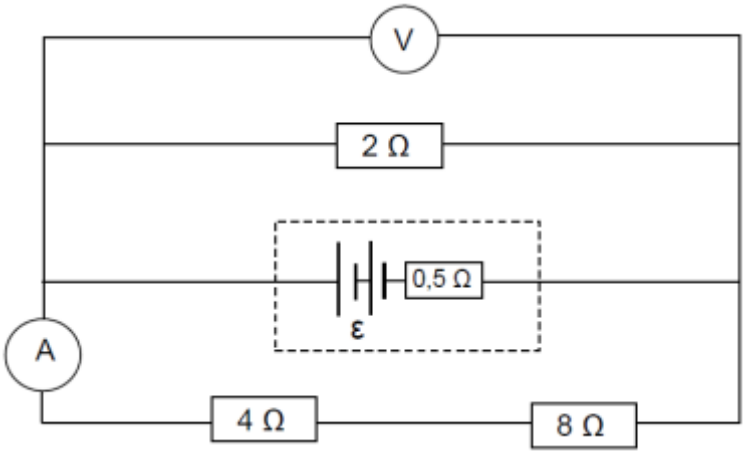
4.2 Calculate the electric field strength at point **P** as a result of Q_1 and Q_2. (7)

4.3 How many electrons are in excess in Q_2 (2)

[12]

QUESTION 5

A battery of an unknown emf and an internal resistance of 0,5 Ω is connected to three resistors, a high-resistance voltmeter and an ammeter of negligible resistance, as shown below.



The reading on the ammeter is 0,2 A.

5.1 Calculate the **emf** of the battery. (6)

5.2 How would the voltmeter reading change if the 2 Ω resistor is removed from the circuit? Write down INCREASE, DECREASE or REMAIN THE SAME. (1)

[7]

/50/